

## CLAIMS

We claim:

1. A method for measuring a concentration of water in argon, hydrogen, nitrogen or helium by ionization mobility spectrometry (IMS), comprising the followings operative steps:

5                   introducing a gas mixture to be analyzed comprising water and at least one selected from the group consisting of argon, hydrogen, nitrogen, and helium into an IMS instrument with a counter-flow of pure gas;

                  obtaining a signal variable over time and proportional to a number of ions detected by an ion detector of the IMS instrument;

10                   determining two time intervals (A, B) corresponding to drift times in the IMS instrument of  $\text{H}_3\text{O}^+$  and  $(\text{H}_2\text{O})_2^+$  ions present in the gas mixture;

                  obtaining peaks of the signal in the two determined time intervals (A, B); and

                  calculating the water concentration in the gas mixture according to a ratio of intensity of the two peaks obtained in the signal.

15                   2. The method according to claim 1, wherein the water concentration in the analyzed gas is calculated by the following formula:

$\text{ppb}_{\text{H}_2\text{O}} = K \ln ((\text{HB} + \text{HA}) / \text{HA})$ , wherein:

$\text{ppb}_{\text{H}_2\text{O}}$  is the water concentration in ppb,

K is a positive constant,

20                   HA is the intensity of the peak of the signal in the time interval (A) corresponding to the drift times of  $\text{H}_3\text{O}^+$  ions in the IMS instrument; and

                  HB is the intensity of the peak of the signal in the time interval (B) corresponding to the drift times of  $(\text{H}_2\text{O})_2^+$  ions in the IMS instrument.

25                   3. The method according to claim 2, wherein areas of the peaks are employed as measures of the intensity of the respective peaks.

4. The method according to claim 2, wherein heights of the peaks are employed as measures of the intensity of the respective peaks.

5. The method according to claim 1, wherein the two time intervals (A, B) corresponding to the drift times of the  $\text{H}_3\text{O}^+$  and  $(\text{H}_2\text{O})_2^+$  ions in the IMS instrument are determined with a preliminary calibrating test carried out with values of operative parameters equal to those employed in an actual analysis.

6. The method according to claim 5, wherein the operative parameters comprise at least a temperature of the analyzed gas mixture.

7. The method according to claim 6, wherein the operative parameters further comprise a ratio between an applied electric field and a gas pressure in a separation zone of the IMS instrument.

8. The method according to claim 5, wherein the analysis is carried out with gases at a temperature of 110 °C and with an electric field of 128 V/cm in a separation zone of the IMS instrument, and the two time intervals (A, B) corresponding to the drift times of the  $\text{H}_3\text{O}^+$  and  $(\text{H}_2\text{O})_2^+$  ions in the IMS instrument are between 15.5 and 17 ms (A) and between 17 and 19 ms (B).